Genital stridulation in male *Psilogramma jordana* Bethune-Baker (Lepidoptera, Sphingidae)

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Abstract

A recording of stridulation of a male *Psilogramma jordana* is analysed and characteristics of the sound are related to the morphology of the stridulatory organ. Stridulation is suggested to be of primary use in courtship behaviour, and as a defence reaction.

Keywords: Courtship, Behaviour, Stridulation, Lepidoptera, Genitalia.

Introduction

In a previous paper, (Robinson, 1969) the life history of *Psilogramma jordana* Bethune-Baker (Lepidoptera, Sphingidae. Acherontiinae) was described and a note made of its habit of stridulation. Subsequent to the publication of this observation, our attention was drawn to a paper by Van Doesburg (1966) in which observations by Muir (1908) and Mell (1902) of stridulation in *Psilogramma menephron* (Cramer) are quoted. Van Doesburg describes the stridulation mechanisms of a number of species of Sphingidae, amongst them *P. menephron,* and he gives excellent illustration of the stridulatory organs of the latter. We have examined the stridulatory organs of both *menephron* and *jordana* and can find no significant difference between the two.

The morphology of the stridulatory mechanism

Examination of a male *jordana* reveals one cluster of plectrum-like scales on the dorsal surface of each valve (pl. fig. 3): both clusters are brought into contact with a comb of spines on the posterior edge of the eighth tergite by lateral movements of the genital armature with the production of a characteristic "tss . . tss . . tss . . tss . ." noise. Bursts of noise have a frequency corresponding to that of movements of the genitalia.

A translation of Van Doesburg's comments on *menephron* reads as follows:

"The grater-scales of *Psilogramma menephron* Cram. are inserted on a very narrow spot on the dorsal vaulting of the valves and constructed as a rough rasp (figs. 17-18). The scales are symmetrical and flattened (fig. 19). The pars stridularis of the stridulation-comb consists of a large number of small, hard, needle-like spines which are inserted and ar-

ranged in regular fashion in rows on the posterior edge (of the eighth tergite) (fig. 21-22)."

On February 7th, 1970, H. S. R. recorded a male *jordana* stridulating, using a portable tape-recorder. The specimen had been attracted to black-light the previous night at Nandarivatu, Viti Levu, Fiji, and was resting on a wall. The senior author received the tape recording and the specimen some two months later.

Characteristics of the sound output

The tape recording made by H. S. R. was analysed using an oscilloscope. Plate fig. 1 shows a continuous recording of stridulation recorded from the oscilloscope screen on slow-moving film. Plate fig. 2 shows a single burst of noise recorded from a triggered sweep of 50cm./sec . . From the continous recording, bursts of noise were found to have a frequency of 5·77/sec . . One burst "cycle" lasted a mean of 173m sec. of which 38m sec. was silence before the next burst of noise.

On the high-speed photographs it was possible to count individual peaks within a single burst. In six photographs (of which pl. fig. 2 is one) the number of peaks per burst of noise ranged from 140 to 230 with a mean of 193.

The noise output from a stridulating *P. jordana* is thus in the region of 193 peaks in 135m sec. corresponding to a frequency of 1,430 c.p.s. emitted in bursts of 135m sec. duration, each burst separated from the next by 38m sec. of silence.

Discussion

We believe that each peak within a burst represents a single tergal spine being struck by a plectrum-scale. In the preparation examined there are about 110 tergal spines of which 25 are set back and 85 which it is theoretically possible that a scale could hit. Presuming that the uppermost scale of each scale-patch strikes a spine, each spine would be hit twice in each lateral movement of the genital armature. This would give an expected output of 170 peaks per burst, consistent with the observed mean of 193.

We can add but little to the observations made in 1969 as to the reasons for stridulation in *Psilogramma*. The purpose of stridulation could be either defensive or it could normally be part of courtship behaviour.

Our translation of Van Doesburg's quotation of Mell's observation throws a little more light on the subject, at least with regard to *P. menephron*:

"I twice observed how the male flew round the female as an introduction to mating and made a perceptible noise. It (stridulation) may be interpreted causally as a noise of excitement which has later become an introduction to mating. It has no protective effect. I saw stridulating *Psilogramma* eaten by giant tree frogs . . ., birds . . ., shrews . . ., and bats." Mell's conclusions seem perfectly plausible although we are inclined to the opinion that stridulation is of a more defensive character

than Mell suggests. *Jordana* nearly always stridulates if provoked by rough handling and in this situation stridulation must be a defensive reaction. We have only Mell's observations on *menephron* as testimony to the ineffectual protection afforded by stridulation.

It is perhaps worthy of note that the surface sculpturing of normal scales on the genitalia of *jordana* and that of the modified plectrum-scales is dissimilar. Plate figures 4 and 5 are electron micrographs of the ridges on normal and plectrum-scale surfaces respectively at a magnification of ×6000. Plate figures 6 and 7 show the scales and their ridges at ×600 magnification.

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Cupido osiris Meigen (*sebrus* Hb.) Observations on the Cohabitation of ssp. *sebrus* and ssp. *bernardiana* in the French Alpes

By M. J. Perceval

Two subspecies of *Cupido osiris* Meigen occur in France, the larger more northern ssp. *bernardiana* Beuret and the smaller southern ssp. *sebrus* Hb. Bretherton (1) gives the respective ranges of *bernardiana* as the Alps and pre-Alps of Savoy and spreading into Switzerland in the Jura, Valais and Ticino, and of *sebrus* as the Basses Alpes and Alpes Maritimes, and reaching west of the Rhone into Ardeche, Gard and Herault.

The distribution, ecology and possible evolution of the two subspecies have been discussed at some length by Descimon (2). While he does not deal with the point of contact between them, he says that their taxonomic relationship should be looked at and that it would be interesting to study their intergrading and